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U. S. DEPARTMENT OF COMMERCE

DANIEL C. ROPER, Secretary

BUREAU OF FISHERIES

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Administrative Report No. 25

PROPAGATION AND DISTRIBUTION OF FOOD FISHES

FISCAL YEAR 1936

By GLEN C. LEACH and M. C. JAMES

APPENDIX III TO REPORT OF COMMISSIONER OF FISHERIES
FOR THE FISCAL YEAR 1936



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ADMINISTRATIVE REPORT SERIES

Since the beginning of the Administrative Report Series, considerable confusion has arisen concerning the system of numbering the separates composing it. Inasmuch as the Reports of the Divisions vary in order from year to year, many have found their designations as "Appendix No. I, II, III, or IV" very confusing. To relieve this, it has been decided to number them as "Administrative Report No. —." Inasmuch as 20 separates had already been printed in this series before starting the numbers, it was deemed advisable to begin the numbering with Administrative Report No. 21. Of course, numbers cannot be printed on those already off the press, but for the information of those who wish to know what the first 24 were, they are numbered for filing purposes as follows:

- No. 1. Report, Commissioner of Fisheries, 1931.
- No. 2. Alaska Fishery and Fur-Seal Industries, 1930.
- No. 3. Fishery Industries of the United States, 1930.
- No. 4. Progress in Biological Inquiries, 1930.
- No. 5. Propagation and Distribution of Food Fishes, 1931.
- No. 6. Report, Commissioner of Fisheries, 1932.
- No. 7. Alaska Fishery and Fur-Seal Industries, 1931.
- No. 8. Fishery Industries of the United States, 1931.
- No. 9. Progress in Biological Inquiries, 1931.
- No. 10. Propagation and Distribution of Food Fishes, 1932.
- No. 11. Alaska Fishery and Fur-Seal Industries, 1932.
- No. 12. Progress in Biological Inquiries, 1932.
- No. 13. Fishery Industries of the United States, 1932.
- No. 14. Propagation and Distribution of Food Fishes, 1933.
- No. 15. Fishery Industries of the United States, 1933.
- No. 16. Alaska Fishery and Fur-Seal Industries, 1933.
- No. 17. Progress in Biological Inquiries, 1933.
- No. 18. Propagation and Distribution of Food Fishes, 1934.
- No. 19. Alaska Fishery and Fur-Seal Industries, 1934.
- No. 20. Fishery Industries of the United States, 1934.
- No. 21. Progress in Biological Inquiries, 1934.
- No. 22. Propagation and Distribution of Food Fishes, 1935.
- No. 23. Alaska Fishery and Fur-Seal Industries, 1935.
- No. 24. Fishery Industries of the United States, 1935.

Note that the last Commissioner's Report was for 1932. Since then its place has been taken by a reprint from the Report of the Secretary of Commerce under the title "Bureau of Fisheries." Inasmuch as it is no longer a Bureau publication, it is not numbered; but it will be supplied to any who request the Report of the Commissioner for any year since 1932.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES, FISCAL YEAR 1936¹

By GLEN C. LEACH, *Chief*, and M. C. JAMES, *Assistant Chief, Division of Fish Culture*

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INTRODUCTION

The production of fish and eggs at Federal hatcheries exceeded any previous year since their inception. There appear elsewhere tabulations and summaries showing the details of this production. The total output amounted to 8,171,000,000 in comparison with 5,071,000,000 of the previous year. It is essential to review these separate statements in order to acquire a clear conception of the exact nature of such a diverse activity, ranging from the planting of fertilized cod eggs on the inshore New England banks to stocking 1-acre cattle tanks with pan fish.

Developments of the past several years have had an interesting bearing upon a matter which is occasionally the subject of critical comment. This is the phase of the Bureau's policy which permits the allocation of fish to so-called private waters, meaning streams or ponds to which the entire public does not have free or unlimited access. The Bureau's policy does not contemplate furnishing fish to exclusive angling clubs or to projects which may be directly commercialized.

¹Administrative Report No. 25, Appendix III to the Report of the U. S. Commissioner of Fisheries for 1936. Approved for publication Jan. 5, 1937.

It does, however, involve the stocking of waters where private riparian rights may be exercised to exclude the general public. This policy has been based upon the knowledge that the overflow from such private waters will go to stock public streams and the private waters frequently serve as more or less well protected nursery areas. Furthermore, the land owner and his friends, having satisfactory fishing in their own waters, are not frequenting the heavily fished public streams.

Further justification for this policy has been observed in the widespread construction of small reservoirs and ponds, particularly through drought areas, in the last several years. Many of these are strictly private and need not be opened to public fishing. It would be an extreme attitude, however, to hold that these hundreds or thousands of square miles of new waters should go unstocked and fishless because the land owners do not make them accessible to the entire public. At a time when public fishing waters are actually congested with anglers, any step which will relieve some of this pressure is in the interest of conservation. It is, therefore, felt fortunate that the Bureau is empowered to provide fish for these new lakes, pools, and reservoirs, whether they be constructed under public or private auspices.

There has been no general modification of the organization or procedure in the conduct of the Federal hatchery system during the past year. Greater attention has been given to an effort to follow through right up to the actual disposition of the fish in the lakes and streams. A hatchery fish improperly planted or placed in suitable waters is an unfinished product and the effort and money expended previously will have been wasted. To the sportsmen in particular, who have cooperated so well, the Bureau is indebted for material aid in developing a more rational system of stocking.

SPECIES PROPAGATED

The list of species handled at the Federal hatchery constitutes a cross section of the most important food and game fishes of the interior and coastal waters of the United States. The kinds handled number the same as during the previous year, namely 43 separate species. There was one change in that the white perch were not propagated during the year but were replaced by a resumption of the hatching of lake herring on Lake Ontario.

It should hardly be necessary to state that of the species listed below very few are available for general distribution throughout the country, and the planting of the various forms is largely confined to the particular areas in which they are indigenous.

CATFISHES (SILURIDAE):

Catfish (*Leptops olivaris*).

Spotted channel catfish (*Ictalurus punctatus*):

Horned pout (*Ameiurus nebulosus*).

CARP (CYPRINIDAE):

Common carp (*Cyprinus carpio*).

BUFFALOFISH (CATOSTOMIDAE):

Common buffalo (*Ictiobus sp.*).

SHAD and HERRING (CLUPEIDAE):

Shad (*Alosa sapidissima*).

SALMONS, TROUTS, and WHITEFISHES (SALMONIDAE):

Common whitefish (*Coregonus clupeaformis*).

Lake herring, cisco (*Leucichthys sp.*).

Chinook, king or quinnat salmon (*Oncorhynchus tshawytscha*):

Chum salmon (*Oncorhynchus keta*).

SALMONS, TROUTS, AND WHITEFISHES—Continued.

- Coho salmon, silver salmon (*Oncorhynchus kisutch*).
 Red salmon, sockeye, or blueback salmon (*Oncorhynchus nerka*).
 Steelhead trout (*Salmo gairdneri*).
 Atlantic salmon (*Salmo salar*).
 Landlocked salmon (*Salmo sebago*).
 Rainbow trout (*Salmo shasta*).
 Black-spotted trout, redthroat trout (*Salmo lewisi*).
 Brown or Loch Leven trout (*Salmo fario* var.).
 Lake trout, Mackinaw trout (*Cristivomer namaycush*).
 Brook trout (*Salvelinus fontinalis*).

GRAYLING (THYMALLIDAE):

- Montana grayling (*Thymallus montanus*).

PIKES (ESOCIDAE):

- Pike and pickerel (*Esox* sp.).

SUNFISHES (CENTRARCHIDAE):

- Crappie (*Pomoxis annularis* and *P. sparoides*).
 Largemouth black bass (*Micropterus salmoides*).
 Smallmouth black bass (*Micropterus dolomieu*).
 Rock bass (*Ambloplites rupestris*).
 Warmouth bass, goggle-eye (*Chaenobryttus gulosus*).
 Bluegill sunfish (*Lepomis incisor*).
 Green sunfish (*Lepomis cyanellus*).
 Redbreasted bream (*Lepomis auritus*).
 Red-eared sunfish (*Lepomis heros*).
 Common sunfish (*Lepomis gibbosus*).
 Rio Grande perch (*Herichthys cyanoguttatus*).

PERCHES (PERCIDAE):

- Pike perch (*Stizostedion vitreum*).
 Yellow perch, ringed perch (*Perca flavescens*).

WHITE BASSES (SERRANIDAE):

- White bass (*Roccus chrysops*).

DRUMS (SCIAENIDAE):

- Fresh-water drum, lake sheepshead (*Aplodinotus grunniens*).

CODS (GADIDAE):

- Cod (*Gadus callarias*).
 Haddock (*Melanogrammus aeglefinus*).
 Pollock (*Pollachius virens*).

FLOUNDERS (PLEURONECTIDAE):

- Winter flounder, American flatfish.

MACKEREL (SCOMBRIDAE):

- Common mackerel (*Scomber scombrus*).

Summary, by species, of the output of fish and fish eggs during the fiscal year ending June 30, 1936

Species	Eggs	Fry	Fingerlings	Total
Catfish.....			6, 673, 000	6, 673, 000
Buffalofish.....	142, 337, 000		1, 218, 255	143, 555, 255
Carp.....	60, 500, 000		3, 277, 600	63, 777, 600
Shad.....		12, 150, 000		12, 150, 000
Whitefish.....		38, 080, 000		38, 080, 000
Lake herring.....	400, 000	2, 740, 000		3, 140, 000
Chinook salmon.....		21, 240	53, 607, 860	53, 629, 100
Chum salmon.....		14, 139, 000	9, 070	14, 148, 070
Silver salmon.....	25, 000	344, 580	4, 990, 740	5, 360, 320
Sockeye salmon.....		11, 038, 000	6, 577, 500	17, 615, 500
Steelhead trout.....	600, 000		809, 000	1, 409, 000
Atlantic salmon.....	1, 000, 000		560, 000	1, 560, 000
Landlocked salmon.....		67, 500	709, 870	777, 370
Rainbow trout.....	2, 758, 000		12, 136, 400	14, 894, 400
Blackspotted trout.....	10, 227, 000		12, 003, 310	22, 230, 310
Loch Leven trout.....	7, 867, 000	1, 105, 000	4, 576, 360	13, 548, 360
Lake trout.....	80, 600	713, 460	113, 875	907, 635
Brook trout.....	4, 518, 000	836, 000	12, 938, 650	18, 292, 650
Grayling.....	350, 000	4, 897, 500	272, 700	5, 520, 200
Pike and pickerel.....			775, 150	775, 150
Crappie.....			16, 188, 250	16, 188, 250
Black bass, largemouth.....		622, 500	3, 641, 160	4, 263, 660
Black bass, smallmouth.....		1, 255, 000	270, 100	1, 525, 100
Rock bass.....			121, 680	121, 680

Summary, by species, of the output of fish and fish eggs during the fiscal year ending June 30, 1936—Continued

Species	Eggs	Fry	Fingerlings	Total
Warmouth bass.....			53, 160	53, 160
Sunfish.....			17, 504, 300	17, 504, 300
Pike perch.....	504, 965, 000	9, 670, 000		514, 635, 000
Yellow perch.....	11, 605, 000	307, 958, 000	147, 000	319, 710, 000
Freshwater drum.....			3, 400	3, 400
White bass.....			17, 000	17, 000
Miscellaneous fishes.....			1, 416, 400	1, 416, 400
Mackerel.....		1, 334, 000		1, 334, 000
Cod.....	3, 416, 733, 000	261, 662, 000		3, 678, 395, 000
Haddock.....	419, 976, 000	9, 588, 000		429, 564, 000
Flatfish (flounder).....	43, 854, 000	1, 435, 283, 000		1, 479, 137, 000
Pollock.....	793, 831, 000	475, 457, 700		1, 269, 288, 700
Total.....	5, 421, 626, 600	2, 588, 962, 480	160, 611, 490	8, 171, 200, 570

PRODUCTION

A jump of approximately 60 percent in the curve of hatchery production during one year must naturally be attributed to some specific circumstances or condition aside from increased efficiency. This increase for the fiscal year 1936 is in a large degree traceable to an expansion of the propagation of marine fishes of the New England coast. Four varieties, the cod, haddock, pollock and flatfish were handled in an aggregate exceeding 6,500,000,000, in comparison with 3,500,000,000 of the same species for the previous year. This work was augmented in response to the expressed desire of Congress, and also due to the fact that it is a form of by-product recovery which can be carried on at relatively small cost.

The planting of over 3,500,000,000 fertilized eggs of these species is accomplished by no more complicated procedure than the placing of spawn takers on commercial fishing vessels operating in inshore New England waters. The eggs returned to the spawning grounds by this means would otherwise be a total loss.

Far greater interest will lie in a study of the output of game fish included in the above totals. The 118,680,000 game and pan fish is approximately 4,000,000 more than were produced last year and is 1.5 percent of the total output. The cost of producing this 1.5 percent, however, is approximately the same as the expense of propagating the remaining 98.5 percent. This is largely due to the fact that the majority of game fish are distributed as fingerlings or larger. One hundred and sixty million fingerlings, 27,000,000 more than last year, went to replenish our fishing waters. The significance of this is that this number of fish will have a much greater chance of surviving the hazards of predators and adverse natural conditions than would a greatly increased number of fry.

Conditions will not permit the Bureau to distribute its game fish at the legal catchable size, as is done by a number of the States, but the trend is constantly toward that end. Since it requires from 3 to 5 pounds of fish food, plus constant and assiduous care for a period of a year or more to produce 1 pound of trout, it will be seen that there are valid reasons why the foregoing objective is not realized 100 percent.

CONSTRUCTION ACTIVITIES

The physical condition of the 80 odd properties used for fish cultural work has an important bearing upon the production of fish. The year's activities involved a normal amount of upkeep and main-

tenance work as well as new construction to augment production facilities. New construction during the year has been mainly confined to three Works Progress Administration projects involving the erection of new fish cultural stations at Uvalde, Tex., Santa Rosa, N. Mex., and Smokemont, N. C., in the Great Smoky Mountain National Park. Active construction was initiated in November and the New Mexico project completed by the close of the fiscal year. In North Carolina the new hatchery was placed on a producing basis but was not fully completed. In Texas the work progressed favorably but considerable remained to be done at the end of the year. In addition the Bureau supervised the construction of hatchery facilities by certain other agencies, the details of which appear elsewhere in this report.

Beyond this, local W. P. A. agencies sponsored projects comprising the enlargement and improvement of several of the Bureau's hatcheries, including those at Rochester, Ind., Natchitoches, La., Lake Mills, Wis., Hagerman, Idaho, and the Upper Mississippi Wild Life and Fish Refuge. Development work also continued at the York Pond, N. H., brook trout station, labor and materials being secured from the Emergency Conservation organization and the W. P. A. C. C. C. workers also effected minor improvements at the Lamar, Pa., hatchery and small details of enrollees were used at several of the western hatcheries. No major items of improvement were effected from the Bureau's regular operating appropriations since it was necessary to devote these funds to the production of fish.

There was placed in operation a new hatchery at Harrison Lake, Va., 26 miles southeast of Richmond. The major portion of the construction on this project had been carried on during the previous fiscal year.

COOPERATION WITH OTHER CONSERVATION AGENCIES

An attempt to show graphically the interrelationship of the Federal hatchery system with other agencies concerned with the conservation of fish life would present a most complicated structure. There are multitudes of contacts throughout the country whereby the propagation and distribution of fish can be handled virtually as a joint enterprise between the Federal Government and the States. In some cases these are based upon specifically formulated agreements, as in the instance of the United States Forest Service and the States of New Hampshire and Vermont. In others they are merely an operating procedure resulting from informal understandings worked out in the field. As an instance of the latter, reference can be made to work in the Rocky Mountain and Pacific coast territory, where the collection of eggs from wild trout is supported by several of the States, who participate in a division of the resulting take. Elsewhere the Bureau's hatcheries are being used to rear game fish and the States contribute to the purchase of fish food.

Another form of valuable coordination lies in the distribution of the Federal hatchery output by the State conservation departments, as is done in Indiana, Georgia, Virginia, and a number of other States. Where Federal and State hatcheries are in juxtaposition it has been possible to concentrate the work in one or the other, or so to divide it as to eliminate any possibility of duplication.

Mention must also be made of the now general practice of submitting Federal fish applications to the State fishery authorities for their

review and approval before deliveries are made. This accomplishes two purposes; first, it prevents the planting of species which might be inimical to whatever stocking policy the State may have developed; second, it makes possible the utilization of the available supply of fish, both State and Federal, to cover the greatest possible territory, and prevents the overstocking of certain waters while others lack needed attention.

So important is the maintenance of working contact with the States that the Division has assigned an employee on full time to act as liaison agent and to work out and maintain these cooperative relationships on a smooth working basis.

As previously, the U. S. Forest Service and the National Park Service have been important beneficiaries of the Bureau's fish cultural work. Probably the most important single phase of the propagation of game fish is the stocking of the public domain principally under the jurisdiction of the above agencies. The other Bureaus and Departments having control of land areas, as for example the Indian Service and the Reclamation Service, must likewise largely depend upon the Federal hatcheries to maintain a supply of fish in the water areas which they administer.

It is most interesting to point out that the newer Governmental agencies are likewise entering the picture under similar conditions. Both the Resettlement Administration and the Tennessee Valley Authority constructed fish hatcheries, which were turned over to the Bureau at the close of the fiscal year for future operation. The former agency developed an excellent hatchery at Hoffman, N. C., as part of a demonstration of land utilization, while the T. V. A. took the first step toward the maintenance of fishing in Norris Lake by constructing a warm-water hatchery below Norris Dam. Tentative plans for further development along this line are in mind.

It is felt that the propagation and distribution of fish, as well as other matters directly related to the administration of fisheries upon Government owned lands, should properly be a responsibility of this Bureau as the agency having the organization, facilities, and the knowledge required.

The maintenance of the closest possible contact with sportsmen's organizations of a semi-public character has not been overlooked. The system of fish nurseries or rearing ponds inaugurated a number of years ago has been continued but no intensive drive is being made to expand this work. Most of the States are now in a position to work more closely with the sportsmen's clubs in their territory in prosecuting such an activity. However, where conditions permit the Bureau has placed its technical information at the disposal of such organizations, this being exemplified in a general program for the establishment of local fish rearing units in the Finger Lakes region in New York. The sportsmen's clubs enlisted the services of the Bureau in laying out a general program for the establishment of the nursery and thereupon presented the matter to the county authorities with the request that they act as sponsors in submitting a W. P. A. project for the construction of the required facilities. While this project had not been brought to fruition at the close of the year, progress was being made in one of the most ambitious programs of this nature yet undertaken.

The Division further feels that it can be of great service to the sportsmen in supplying the technical information, showing them what they

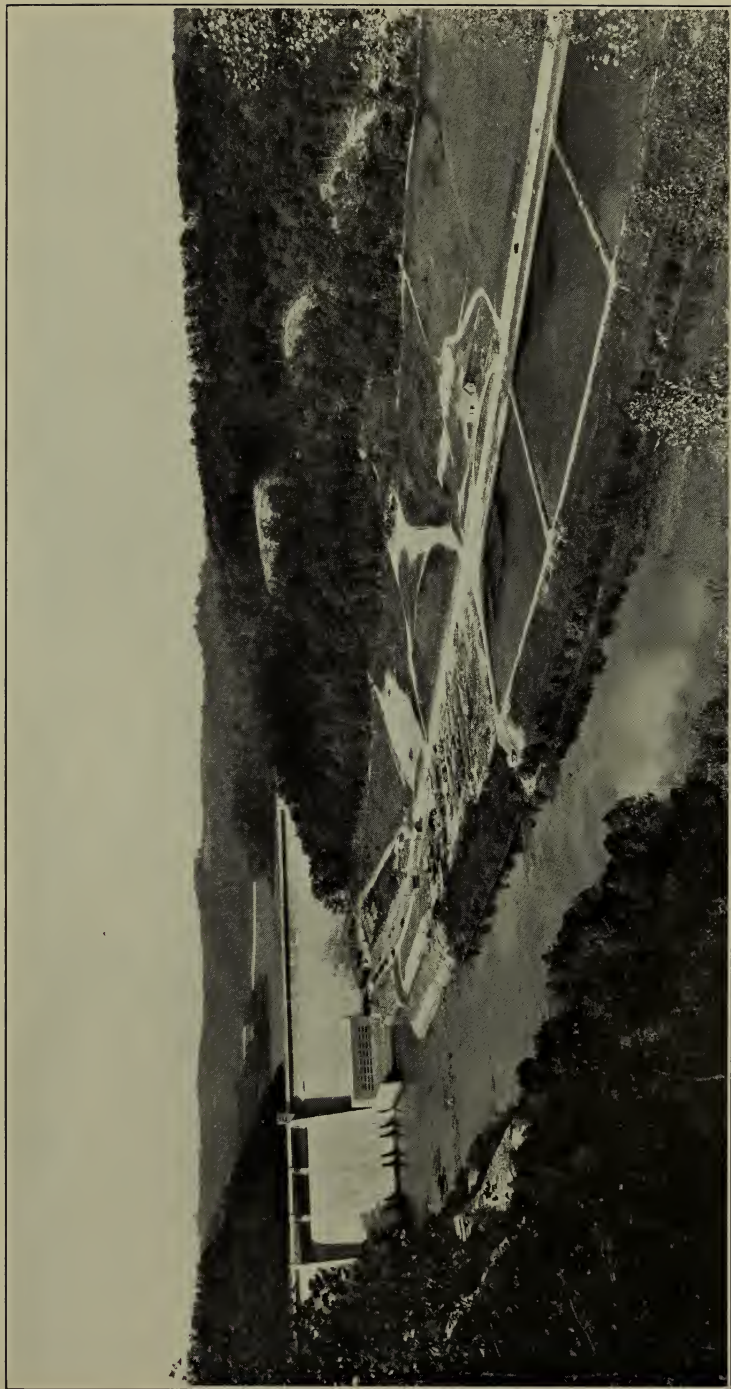


FIGURE 1.—HATCHING PONDS BELOW NORRIS DAM, TENN.
Hatchery constructed by Tennessee Valley Authority for operation by Bureau of Fisheries.

can or cannot do in the way of increasing the supply of fish in their strictly local waters.

In summary, there are three institutions engaged in propagating fish for public benefit; namely, the Federal Government, the States, and semi-public clubs. From a practical standpoint they might well be considered as parts of the same organization and the ultimate objective sought is that the work be carried on as if this situation actually prevailed.

SALVAGE OPERATIONS

The Upper Mississippi Wild Life and Fish Refuge was again the scene of the activities of seining crews salvaging stranded fish from land-locked pools stretching several hundred miles along the river. While the entire territory included in the refuge could not be fully covered by the crews, a total of 43,500,000 fish was saved from the sure death of receding waters and transferred to the main river or distributed to other waters. The latter disposal accounted for only a small fraction of the total number handled. Slightly over 850,000 were utilized for the filling of applications away from the river.

A strong demand has been built up in the Middle West for these fish since they are of large fingerling size when seined and are highly valuable for stocking. The Bureau has not been able to accede to this demand because it is felt that diversion of the fish to distant points would be an unjustifiable drain upon the resources of the Refuge. The future shipments from this source will be even less for the reason that the development of the 9 foot channel up to the Twin Cities is automatically going to make salvage work unnecessary and impossible. Already the progress of construction has limited salvage operations and within a year or two the rescue work will be largely a thing of the past. In lieu of this the Bureau is establishing large propagating ponds at various points within the refuge for the production of fish for distribution. Means will have to be devised to augment the area of these ponds if the demands are to be met in the future.

Number and disposition of fish rescued, fiscal year 1936

Locality and species	Delivered to applicants	Restored to original waters	Total number of fish
All stations:			
Black bass.....	188, 140	141, 695	329, 835
Buffalofish.....		1, 218, 125	1, 218, 125
Carp.....		3, 267, 600	3, 267, 600
Catfish.....	49, 875	6, 207, 820	6, 257, 695
Crappie.....	259, 375	15, 706, 655	15, 966, 030
Drum.....		3, 290	3, 290
Pike-Pickrel.....	1, 900	773, 252	775, 152
Sunfish.....	347, 660	13, 506, 880	13, 854, 540
White bass.....		17, 000	17, 000
Yellow perch.....	4, 626	116, 078	120, 704
Miscellaneous Fishes.....		1, 709, 400	1, 709, 400
Total.....	851, 576	42, 667, 795	43, 519, 371
Summary by stations:			
Fairport.....	292, 145	992, 810	1, 284, 955
La Crosse.....	20, 165	3, 501, 956	3, 522, 121
Lynxville.....	23, 240	7, 564, 950	7, 588, 190
Bellevue.....	98, 480	5, 617, 270	5, 715, 750
Homer.....	251, 291	3, 117, 834	3, 369, 125
Marquette.....	166, 255	21, 872, 975	22, 039, 230
Total.....	851, 576	42, 667, 795	43, 519, 371

ASSIGNMENTS OF FISH AND FISH EGGS TO STATES, TERRITORIES, AND FOREIGN COUNTRIES

Thirty-two States have included in their output fish which were derived directly or indirectly from Federal hatchery operations. In fact 639,000,000 eggs, fry, and fingerlings comprised the total of assignments to the State Fish and Game Departments. The bulk of these were eggs since these constituted raw material which can be most easily handled in transit. It should be pointed out that this does not all represent "Federal aid" or donations but in many instances the assignments are the result of cooperative arrangements under which the States stand their full share of the cost of producing the fish or eggs which they receive.

There has been a constant increase in the totals covered by these cooperative relationships. The following list shows no shipments made to foreign countries. There was, however, a routine exchange of eggs with the Dominion of Canada. This is an annual arrangement whereby the Bureau obtains Atlantic salmon eggs as compensation for assignment of cut-throat trout eggs. It will also be noted that a shipment of rainbow trout eggs was made to Puerto Rico in continuation of the program of the insular Government to establish this game species in the mountainous sections of the Island.

The services of the Assistant Chief of the Division of Fish Culture were loaned to make a survey of Lake Titicaca, South America, for the Peruvian and Bolivian Governments. No shipments of fish have as yet been made as a consequence of this study, however.

Assignments of fish and fish eggs to State fish commissions, fiscal year 1936

States and species	Eggs	Fry	Fingerlings et cetera	Totals
Arizona:				
Blackspotted trout.....	750,000			750,000
Brook trout.....	302,000			302,000
Arkansas:				
Black bass, smallmouth.....		100,000		100,000
Colorado:				
Lake trout.....	25,620			25,620
Loch Leven trout.....	600,160			600,160
Connecticut:				
Black bass, smallmouth.....		409,000		409,000
Lake trout.....	25,000			25,000
Loch Leven trout.....	100,500			100,500
Rainbow trout.....	100,000			100,000
Georgia:				
Black bass, largemouth.....			48,795	48,795
Black bass, smallmouth.....		80,000		80,000
Catfish.....			3,045	3,045
Sunfish.....			324,150	324,150
Rainbow trout.....	301,600			301,600
Idaho:				
Blackspotted trout.....			182,000	182,000
Brook trout.....	102,500		17,500	120,000
Loch Leven trout.....			52,000	52,000
Rainbow trout.....	500,160		975,000	1,475,160
Steelhead salmon.....			46,500	46,500
Illinois:				
Black bass, largemouth.....			13,500	13,500
Catfish.....			12,000	12,000
Crappie.....			10,000	10,000
Sunfish.....			20,000	20,000
Indiana:				
Brook trout.....	154,800			154,800
Loch Leven trout.....	180,600			180,600
Rainbow trout.....	42,600			42,600
Black bass.....			51,125	51,125
Catfish.....			9,200	9,200
Rock bass.....			4,000	4,000
Sunfish.....			178,600	178,600
Yellow perch.....			4,000	4,000

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Assignments of fish and fish eggs to State fish commissions, fiscal year 1936—Con.

States and species	Eggs	Fry	Fingerlings et cetera	Totals
Iowa:				
Black bass, largemouth			10,000	10,000
Crappie			15,000	15,000
Sunfish			13,500	13,500
Brook trout	5,000			5,000
Loch Leven trout	101,000			101,000
Rainbow trout	40,000			40,000
Maine:				
Atlantic salmon	1,000,000			1,000,000
Maryland:				
Rainbow trout	75,000			75,000
Massachusetts:				
Loch Leven trout	100,500			100,500
Rainbow trout	100,000			100,000
Michigan:				
Brook trout	508,000		11,735	519,735
Rainbow trout			4,000	4,000
Minnesota:				
Black bass, largemouth			16,500	16,500
Lake trout			11,000	11,000
Montana:				
Loch Leven trout	2,000,000			2,000,000
Black bass, largemouth			25,830	25,830
Catfish			6,000	6,000
Crappie			3,500	3,500
Sunfish			25,500	25,500
Yellow perch			18,700	18,700
Nebraska:				
Brook trout			3,500	3,500
Loch Leven trout			15,500	15,500
Rainbow trout	57,000			57,000
New Hampshire:				
Brook trout	500,000	433,500	8,900	942,400
New Mexico:				
Black bass			201,000	201,000
Catfish			17,300	17,300
Crappie			5,000	5,000
Sunfish			56,000	56,000
North Carolina:				
Brook trout			28,000	28,000
Loch Leven trout	361,500			361,500
Rainbow trout	101,000		135,200	236,200
North Dakota:				
Black bass			7,720	7,720
Crappie			7,000	7,000
Sunfish			16,000	16,000
Ohio:				
Pike perch	548,480,000			548,480,000
Rainbow trout			30,000	30,000
Whitefish		32,680,000		32,680,000
Oregon:				
Blackspotted trout			97,800	97,800
Chinook salmon	15,490,000			15,490,000
Rainbow trout			260,580	260,580
Silver salmon			9,600	9,600
Steelhead trout	600,000			600,000
South Carolina:				
Black bass		11,500		11,500
Loch Leven trout	50,500			50,500
Rainbow trout			17,000	17,000
South Dakota:				
Loch Leven trout	206,500			206,500
Tennessee:				
Loch Leven trout	103,700		60,000	163,700
Rainbow trout	550,000		110,000	660,000
Sunfish			2,500	2,500
Utah:				
Brook trout			81,000	81,000
Grayling	125,000			125,000
Rainbow trout			75,000	75,000
Vermont:				
Brook trout	500,000	384,680	62,000	946,680
Landlocked salmon		67,000	46,000	113,000
Pike perch	11,605,000			11,605,000
Yellow perch	11,050,000			11,050,000
Virginia:				
Brook trout	760,000		25,000	785,000
Rainbow trout			150,340	150,340
Washington:				
Blackspotted trout			5,000	5,000
Grayling			125,000	125,000
Rainbow trout			543,600	543,600

Assignments of fish and fish eggs to State fish commissions, fiscal year 1936—Con.

States and species	Eggs	Fry	Fingerlings et cetera	Totals
West Virginia:				
Brook trout.....	750,000		213,050	963,050
Loch Leven trout.....	501,000		388,500	889,500
Rainbow trout.....			541,000	541,000
Wisconsin:				
Black bass.....			28,350	28,350
Crappie.....			17,300	17,300
Loch Leven trout.....			28,250	28,250
Sunfish.....			16,700	16,700
Wyoming:				
Brook trout.....			27,000	27,000
Loch Leven trout.....	680,300			680,300
Total.....	599,586,540	34,165,680	5,574,370	639,326,590

Assignments of fish and fish eggs to territories, fiscal year 1936

Territory and species	Eggs
Puerto Rico: Rainbow trout.....	100,000

TRANSFER OF EGGS BETWEEN STATIONS

There is a great difference in the efficiency of hatcheries due to varying local conditions. At certain points brood stock can be reared most economically for egg production and these hatcheries are used as sources of general supply for trout eggs for the entire Bureau. The accompanying table showing the transfer of eggs between stations will illustrate the extent of this practice. In some instances, as in the case of the Creede, Colo., and Ennis, Mont., stations, the eggs are collected from wild or semi-wild fish. This procedure has made it possible to secure a stock of eggs from the Bureau's own resources without the necessity of purchasing any from commercial sources.

Transfer of eggs between stations, fiscal year 1936

Species	Number of eggs	From—	To—
Black-spotted trout.....	150,420	Saratoga, Wyo.....	Bozeman, Mont.
	150,300	do.....	Springville, Utah.
	481,700	Yellowstone Park, Wyo.....	Bozeman, Mont.
	704,000	do.....	Birdsview, Wash.
	250,000	do.....	Clackamas, Oreg.
	350,000	do.....	Crawford, Nebr.
	1,500,000	do.....	Jackson Hole, Wyo.
	500,000	do.....	Hagerman, Idaho.
	1,325,000	do.....	Leadville, Colo.
	700,000	do.....	Quinalt, Wash.
	200,000	do.....	Saratoga, Wyo.
	75,000	do.....	Spearfish, S. D.
	2,150,000	do.....	Springville, Utah.
Brook trout.....	150,000	Berkshire, Mass.....	Nashua, N. H.
	45,000	Craig Brook, Maine.....	Duluth, Minn.
	200,000	do.....	La Crosse, Wis.
	100,000	do.....	Manchester, Iowa.
	570,000	do.....	Nashua, N. H.
	200,000	do.....	Northville, Mich.
	200,000	do.....	Ogletown, Pa.
	400,000	do.....	White Sulphur Springs, W. Va.
	600,000	do.....	Wytheville, Va.
	251,000	Leadville, Colo.....	Crawford, Nebr.
	104,000	do.....	Creede, Colo.
	202,000	do.....	La Crosse, Wis.
	102,000	do.....	Hagerman, Idaho.
	405,000	do.....	Saratoga, Wyo.

Transfer of eggs between stations, fiscal year 1936—Continued

Species	Number of eggs	From—	To—
Brook trout.....	355,000	Leadville, Colo.....	Spearfish, S. D.
	400,000	do.....	Springville, Utah.
	300,550	Creede, Colo.....	Bozeman, Mont.
	508,475	do.....	Duluth, Minn.
	150,750	do.....	La Crosse, Wis.
	100,400	do.....	Lake Mills, Wis.
	100,430	do.....	Manchester, Iowa.
	502,460	do.....	Northville, Mich.
	250,000	do.....	Spearfish, S. D.
	602,250	do.....	Springville, Utah.
	100,000	do.....	Clackamas, Oreg.
	100,535	Pittsford, Vt.....	Cape Vincent, N. Y.
	50,000	do.....	Leetown, W. Va.
	262,450	do.....	Berlin, N. H.
	200,000	York Pond, N. H.....	Barneveld, N. Y.
	795,000	do.....	Cape Vincent, N. Y.
	450,000	do.....	Cortland, N. Y.
	450,000	do.....	Erwin, Tenn.
	308,000	do.....	St. Johnsbury, Vt.
	650,000	do.....	White Sulphur Springs, W. Va.
Brook trout.....	107,100	Saratoga, Wyo.....	Jackson Hole, Wyo.
Grayling.....	500,000	Yellowstone Park, Wyo.....	Bozeman, Mont.
	100,000	do.....	Spearfish, S. Dak.
	357,000	do.....	Spokane, Wash.
	500,000	do.....	Springville, Utah.
Lake trout.....	30,000	Cape Vincent, N. Y.....	Cortland, N. Y.
Landlocked salmon.....	20,000	Craig Brook, Maine.....	Nashua, N. H.
Lock Leven trout.....	100,580	Bozeman, Mont.....	Cape Vincent, N. Y.
	487,200	do.....	Clackamas, Oreg.
	172,800	do.....	Crawford, Nebr.
	151,340	do.....	Duluth, Minn.
	50,500	do.....	Erwin, Tenn.
	273,680	do.....	Hagerman, Idaho.
	332,440	do.....	La Crosse, Wis.
	151,200	do.....	Lake Mills, Wis.
	100,700	do.....	Leetown, W. Va.
	356,400	do.....	Manchester, Iowa.
	50,500	do.....	Ogletown, Pa.
	100,500	do.....	Rochester, N. Y.
	384,600	do.....	Saratoga, Wyo.
	356,400	do.....	Spearfish, S. Dak.
	610,440	do.....	Springville, Utah.
	251,500	do.....	White Sulphur Spr., W. Va.
Rainbow trout.....	100,320	do.....	Butte Falls, Oreg.
	250,400	do.....	Glacier Park, Mont.
	1,416,000	do.....	Meadow Creek, Mont.
	201,600	do.....	Quinault, Wash.
	361,600	do.....	Spearfish, S. Dak.
	150,320	do.....	Spokane, Wash.
	362,900	Manchester, Iowa.....	Bozeman, Mont.
	331,100	do.....	Crawford, Nebr.
	153,100	do.....	Duluth, Minn.
	303,000	do.....	La Crosse, Wis.
	76,000	do.....	Lake Mills, Wis.
	305,600	do.....	Northville, Mich.
	15,000	Neosho, Mo.....	Aquarium, Wash., D. C.
	310,000	do.....	Bozeman, Mont.
	102,000	do.....	Butte Falls, Oreg.
	97,000	do.....	Crawford, Nebr.
	80,000	do.....	Ogletown, Pa.
	612,000	do.....	Saratoga, Wyo.
	166,780	Springville, Utah.....	Birdsview, Wash.
	350,550	do.....	Hagerman, Idaho.
	100,640	do.....	Quinault, Wash.
	100,000	White Sulphur Springs, W. Va.....	Ogletown, Pa.
	25,000	Wytheville, Va.....	Aquarium, Wash., D. C.
	100,000	do.....	Barneveld, N. Y.
	75,000	do.....	Rochester, N. Y.
Silver salmon.....	70,000	Birdsview, Wash.....	Leetown, W. Va.

STATION OUTPUT

The following summary indicates the location of the producing units and the number and species which each has contributed to the replenishment of the lakes and streams of the country. Forty-three main stations and 38 substations are listed, representing an increase of 4 substations over the summary for last year. This increase arises

from the placing in operation of new projects at Spokane, Wash., San Angelo, Tex., Harrison Lake, Va., and the reestablishment of limited operations at the Swanton, Vt., station previously closed. While each of these hatcheries is primarily intended for the restocking of waters in its own contiguous area, the output of any of them may nevertheless reach 2 or 3 different States. The designation as main station or substation is not necessarily due to the size of the establishment or the magnitude of output but is a more or less arbitrary separation for administrative purposes.

It appears advisable to repeat the statement in previous reports that all carp shown in the list are replanted directly in commercial fishing waters, from which the eggs are secured and in which this species is now well established. No carp are planted except under the foregoing conditions.

Stations and substations operated and the output of each, fiscal year 1936

Stations, substations, and species	Eggs	Fry	Fingerlings	Totals
Baird, Calif.:				
Chinook salmon.....			5,260	5,260
Battle Creek, Calif.:				
Chinook salmon.....			5,055,410	5,055,410
Mill Creek, Calif.:				
Chinook salmon.....		1,620,000	3,141,735	4,761,735
Birdsview, Wash.:				
Blackspotted trout.....			352,000	352,000
Chinook salmon.....			136,000	136,000
Silver salmon.....	25,000		2,762,000	2,787,000
Sockeye salmon.....			269,500	269,500
Steelhead trout.....			289,000	289,000
Baker Lake, Wash.:				
Blackspotted trout.....			48,700	48,700
Mt. Rainier, Wash.:				
Blackspotted trout.....			188,900	188,900
Brook trout.....			308,445	308,445
Rainbow trout.....			292,400	292,400
Steelhead trout.....			17,600	17,600
Spokane, Wash.:				
Blackspotted trout.....			21,750	21,750
Grayling.....			250,000	250,000
Rainbow trout.....			266,620	266,620
Berkshire Trout Hatchery, Mass.:				
Brook trout.....			114,630	114,630
Catfish.....			1,525	1,525
Black bass, smallmouth.....		840,000		840,000
Boothbay Harbor, Maine:				
Cod.....	953,619,000			953,619,000
Flounder.....		1,015,200,000		1,015,200,000
Haddock.....	135,094,000			135,094,000
Bozeman, Mont.:				
Blackspotted trout.....			1,814,150	1,814,150
Brook trout.....			276,135	276,135
Loch Leven trout.....	6,134,660			6,134,660
Rainbow trout.....			744,815	744,815
Ennis, Mont.:				
Blackspotted trout.....			236,370	236,370
Loch Leven trout.....	1,460,000	1,105,000	1,285,130	3,850,130
Rainbow trout.....			700,205	700,205
Miles City, Mont.:				
Black bass, largemouth.....			93,030	93,030
Catfish.....			12,100	12,100
Crappie.....			46,660	46,660
Sunfish.....			72,635	72,635
Yellow perch.....			18,720	18,720
Cape Vincent, N. Y.:				
Brook trout.....			1,500	1,500
Lake herring.....	400,000	2,740,000		3,140,000
Lake trout.....	35,000	493,000	2,700	530,700
Loch Leven trout.....	35,000			35,000
Black bass, smallmouth.....			49,900	49,900
Whitefish.....		3,125,000		3,125,000
Barneveld, N. Y.:				
Brook trout.....			66,900	66,900
Loch Leven trout.....			16,500	16,500
Rainbow trout.....			7,950	7,950

PROPAGATION AND DISTRIBUTION OF FOOD FISHES, 1936 361

Stations and substations operated and the output of each, fiscal year 1936—Contd.

Stations, substations, and species	Eggs	Fry	Fingerlings	Totals
Cape Vincent, N. Y.—Continued.				
Cortland, N. Y.:				
Brook trout.....			135, 770	135, 770
Swanton, Vt.:				
Pike perch.....	11, 605, 000			11, 605, 000
Yellow perch.....	11, 050, 000			11, 050, 000
Rochester, N. Y.:				
Black bass, largemouth.....			3, 000	3, 000
Brook trout.....			4, 160	4, 160
Loch Leven trout.....			75, 570	75, 570
Smallmouth bass.....			14, 500	14, 500
Rainbow trout.....			80, 920	80, 920
Watertown, N. Y.:				
Brook trout.....			104, 015	104, 015
Lake trout.....		27, 960	46, 875	74, 835
Loch Leven trout.....			77, 250	77, 250
Rainbow trout.....			1, 460	1, 460
Clackamas, Oreg.:				
Blackspotted trout.....			97, 800	97, 800
Brook trout.....	50, 000		98, 900	148, 900
Chinook salmon.....			5, 242, 000	5, 242, 000
Loch Leven trout.....	78, 000			78, 000
Rainbow trout.....	50, 000		214, 580	264, 580
Silver salmon.....			33, 480	33, 480
Big White Salmon, Wash.:				
Chinook salmon.....	4, 484, 000		10, 161, 225	14, 645, 225
Butte Falls, Oreg.:				
Blackspotted trout.....			125, 000	125, 000
Chinook salmon.....			18, 297, 680	18, 297, 680
Silver salmon.....			674, 600	674, 600
Steelhead trout.....	600, 000		302, 900	902, 900
Little White Salmon, Wash.:				
Chinook salmon.....	21, 960, 000		11, 584, 335	33, 544, 335
Craig Brook, Maine:				
Atlantic salmon.....	1, 000, 000		568, 000	1, 568, 000
Brook trout.....			460, 800	460, 800
Landlocked salmon.....			394, 500	394, 500
Smelt.....	5, 000, 000			5, 000, 000
Crawford, Nebr.:				
Black bass, largemouth.....			82, 340	82, 340
Blackspotted trout.....			233, 565	333, 565
Brook trout.....			358, 850	358, 850
Catfish.....			226, 300	226, 300
Crappie.....			64, 975	64, 975
Loch Leven trout.....			287, 600	287, 600
Rainbow trout.....			444, 860	444, 860
Rock bass.....			9, 100	9, 100
Sunfish.....			3, 600	3, 600
Dexter, N. Me.x:				
Black bass, largemouth.....			363, 310	363, 310
Catfish.....			21, 055	21, 055
Crappie.....			5, 750	5, 750
Sunfish.....			100, 585	100, 585
Duluth, Minn.:				
Brook trout.....			226, 000	226, 000
Lake trout.....	25, 600	192, 500	64, 000	282, 100
Loch Leven trout.....			52, 000	52, 000
Pike perch.....		9, 670, 000		9, 670, 000
Rainbow trout.....			33, 000	33, 000
Whitefish.....		1, 275, 000		1, 275, 000
Edenton, N. C.:				
Black bass, largemouth.....		16, 200	15, 750	31, 950
Shad.....		2, 600, 000		2, 600, 000
Sunfish.....			23, 700	23, 700
Warmouth bass.....			175	175
Yellow perch.....			385	385
Erwin, Tenn.:				
Black bass, largemouth.....		20, 000	2, 790	22, 790
Brook trout.....			100, 000	100, 000
Loch Leven trout.....			18, 500	18, 500
Rainbow trout.....			570, 275	570, 275
Rock bass.....			23, 400	23, 400
Sunfish.....			129, 175	129, 175
Fairport, Iowa:				
Black bass, largemouth.....		54, 500	95, 400	149, 900
Buffalofish.....	84, 212, 500		46, 525	84, 259, 025
Carp.....	1, 500, 000		158, 600	1, 658, 600
Catfish.....			451, 185	451, 185
Crappie.....			232, 760	232, 760
Drum.....			35	35
Sunfish.....			266, 825	266, 825
White bass.....			225	225
Yellow perch.....			1, 000	1, 000
Miscellaneous fishes.....			32, 400	32, 400

Stations and substations operated and the output of each, fiscal year 1936—Contd.

Stations, substations, and species	Eggs	Fry	Fingerlings	Totals
Flintville, Tenn.:				
Black bass, largemouth.....			4, 150	4, 150
Black bass, smallmouth.....			75	75
Crappie.....			50	50
Loch Leven trout.....			114, 000	114, 000
Rainbow trout.....			161, 000	161, 000
Rock bass.....			1, 200	1, 200
Sunfish.....			8, 925	8, 925
Fort Belvoir, Va.:				
Black bass, largemouth.....			1, 555	1, 555
Crappie.....			400	400
Shad.....		11, 850, 000		11, 850, 000
Sunfish.....			1, 225	1, 225
Yellow perch.....		307, 958, 000		307, 958, 000
Lakelands Ponds, Md.:				
Black bass, largemouth.....			100	100
Crappie.....			510	510
Yellow perch.....			2, 200	2, 200
Sunfish.....			72, 100	72, 100
Gloucester, Mass.:				
Cod.....	2, 463, 113, 000	262, 662, 000		2, 725, 775, 000
Flatfish.....	43, 854, 000	19, 512, 000		63, 366, 000
Haddock.....	284, 642, 000	95, 588, 000		380, 230, 000
Pollock.....	793, 831, 700	475, 457, 700		1, 269, 289, 400
Hagerman, Idaho:				
Blackspotted trout.....			58, 380	58, 380
Brook trout.....			46, 140	46, 140
Loch Leven trout.....			52, 000	52, 000
Rainbow trout.....			769, 100	769, 100
Salmon, Idahc:				
Blackspotted trout.....			93, 450	93, 450
Rainbow trout.....			659, 700	659, 700
Steelhead trout.....			40, 500	40, 500
La Crosse, Wis.:				
Black bass, largemouth.....			18, 000	18, 000
Brook trout.....			539, 200	539, 200
Buffalofish.....			92, 300	92, 300
Carp.....			483, 500	483, 500
Catfish.....			352, 200	352, 200
Crappie.....			1, 375, 000	1, 375, 000
Loch Leven trout.....			350, 900	350, 900
Pike-Pickerel.....			321, 800	321, 800
Rainbow trout.....			295, 600	295, 600
Sunfish.....			849, 800	849, 800
White bass.....			700	700
Yellow perch.....			19, 200	19, 200
Bellevue, Iowa:				
Black bass, largemouth.....			84, 500	84, 500
Buffalofish.....	68, 125, 000		257, 900	68, 382, 900
Carp.....	59, 000, 000		661, 000	59, 661, 000
Catfish.....			598, 500	598, 500
Crappie.....			1, 822, 875	1, 822, 875
Drum.....			1, 400	1, 400
Pike-Pickerel.....			2, 600	2, 600
Sunfish.....			1, 706, 250	1, 706, 250
White bass.....			6, 475	6, 475
Yellow perch.....			2, 650	2, 650
Miscellaneous fishes.....			556, 000	556, 000
Homer, Minn.:				
Black bass, largemouth.....			13, 700	13, 700
Buffalofish.....			100	100
Carp.....			12, 000	12, 000
Catfish.....			75, 800	75, 800
Crappie.....			1, 824, 700	1, 824, 700
Drum.....			1, 850	1, 850
Pike-Pickerel.....			404, 150	404, 150
Sunfish.....			522, 225	522, 225
White bass.....			2, 400	2, 400
Yellow perch.....			4, 200	4, 200
Miscellaneous fishes.....			508, 000	508, 000
Lake Mills, Wis.:				
Black bass, largemouth.....			13, 650	13, 650
Black bass, smallmouth.....			10, 165	10, 165
Brook trout.....			89, 500	89, 500
Crappie.....			1, 400	1, 400
Loch Leven trout.....			86, 000	86, 000
Rainbow trout.....			63, 850	63, 850
Rock bass.....			2, 300	2, 300
Sunfish.....			5, 575	5, 575
Lynxville, Wis.:				
Black bass, largemouth.....			13, 800	13, 800
Buffalofish.....			28, 500	28, 500
Carp.....			51, 500	51, 500
Catfish.....			207, 000	207, 000

PROPAGATION AND DISTRIBUTION OF FOOD FISHES, 1936 363

Stations and substations operated and the output of each, fiscal year 1936—Contd.

Stations, substations, and species	Eggs	Fry	Fingerlings	Totals
La Crosse, Wis.—Continued.				
Lynxville, Wis.—Continued.				
Crappie.....			3,040,000	3,040,000
Pike-pickereel.....			4,200	4,200
Sunfish.....			1,622,440	1,622,440
White bass.....			3,600	3,600
Yellow perch.....			4,150	4,150
Miscellaneous fishes.....			603,000	603,000
Marquette, Iowa:				
Black bass, largemouth.....			56,800	56,800
Buffalofish.....			792,800	792,800
Carp.....			1,901,000	1,901,000
Catfish.....			4,548,000	4,548,000
Crappie.....			7,670,700	7,670,700
Pike-pickereel.....			42,400	42,400
Sunfish.....			6,887,000	6,887,000
White bass.....			3,600	3,600
Yellow perch.....			89,300	89,300
Rochester, Ind.				
Black bass, largemouth.....			83,285	83,285
Black bass, smallmouth.....			200	200
Catfish.....			11,800	11,800
Crappie.....			1,825	1,825
Rock bass.....			17,950	17,950
Sunfish.....			142,830	142,830
Yellow perch.....			5,100	5,100
Upper Mississippi River Ponds:				
Black bass, largemouth.....		128,000	304,775	432,775
Black bass, smallmouth.....			1,125	1,125
Catfish.....			7,010	7,010
Crappie.....			20,950	20,950
Sunfish.....			37,715	37,715
Lake Park, Ga.:				
Black bass, largemouth.....			3,055	3,055
Catfish.....			6,808	6,880
Sunfish.....			226,700	226,700
Warm Springs, Ga.:				
Black bass, largemouth.....		11,900	333,625	345,525
Catfish.....			1,560	1,560
Sunfish.....			458,050	458,050
Lamar, Pa.:				
Brook trout.....			97,060	97,060
Loch Leven trout.....			14,150	14,150
Rainbow trout.....			61,500	61,500
Leadville, Colo.:				
Blackspotted trout.....			581,000	581,000
Brook trout.....	1,320,000		2,442,000	3,762,000
Loch Leven trout.....	100,000		158,000	258,000
Rainbow trout.....			729,600	729,600
Creede, Colo.:				
Blackspotted trout.....			427,700	427,700
Brook trout.....	1,773,700		1,520,250	3,293,950
Loch Leven trout.....			75,020	75,020
Rainbow trout.....			543,550	543,550
Eagles Nest, N. Mex.:				
Blackspotted trout.....			55,000	55,000
Brook trout.....			16,000	16,000
Loch Leven trout.....			70,500	70,500
Rainbow trout.....			249,000	249,000
Leetown, W. Va.:				
Black bass, largemouth.....			1,355	1,355
Black bass, smallmouth.....			29,565	29,565
Blackspotted trout.....			700	700
Brook trout.....			61,375	61,375
Loch Leven trout.....			29,400	29,400
Rainbow trout.....			138,120	138,120
Silver salmon.....			27,000	27,000
Sunfish.....			4,600	4,600
Louisville, Ky.:				
Black bass, largemouth.....			29,200	29,200
Black bass, smallmouth.....		250,000	3,950	253,950
Crappie.....			150	150
Rock bass.....			4,410	4,410
Sunfish.....			2,900	2,900
Mammoth Spring, Ark.:				
Black bass, largemouth.....			174,925	174,925
Black bass, smallmouth.....		165,000	100,225	265,225
Rock bass.....			25,500	25,500
Sunfish.....			81,000	81,000
Manchester, Iowa:				
Black bass, smallmouth.....			8,930	8,930
Brook trout.....	5,000		167,350	172,350
Loch Leven trout.....	60,000		232,700	292,700
Rainbow trout.....	151,300		45,170	196,470
Rock bass.....			5,300	5,300

Stations and substations operated and the output of each, fiscal year 1936—Contd.

Stations, substations, and species	Eggs	Fry	Fingerlings	Totals
Marion, Ala.:				
Black bass, largemouth		18, 000	409, 500	427, 500
Sunfish			539, 160	539, 160
Tupelo, Miss.:				
Black bass, largemouth		89, 000	272, 500	361, 500
Sunfish			190, 025	190, 025
Nashua, N. H.:				
Black bass, smallmouth			1, 750	1, 750
Brook trout			180, 625	180, 625
Catfish			3, 275	3, 275
Landlocked salmon			19, 500	19, 500
Rainbow trout			4, 530	4, 530
National Forest of N. H. (Berlin, N. H.):				
Brook trout	1, 000, 000	242, 000	238, 140	1, 480, 140
St. Johnsbury, Vt.:				
Black bass, smallmouth			3, 150	3, 150
Brook trout			544, 500	770, 680
Landlocked salmon			67, 500	127, 140
Neosho, Mo.:				
Black bass, largemouth		170, 000	76, 930	246, 930
Crappie			3, 400	3, 400
Rainbow trout	308, 000		38, 670	346, 670
Rock bass			4, 925	4, 925
Sunfish			24, 550	24, 550
Natchitoches, La.:				
Black bass, largemouth			110, 875	110, 875
Sunfish			15, 365	15, 365
Warmouth bass			8, 400	8, 400
Tishomingo, Okla.:				
Black bass, largemouth			139, 555	139, 555
Catfish			18, 630	18, 630
Crappie			77, 205	77, 205
Sunfish			170, 910	170, 910
Warmouth bass			25, 700	25, 700
Northville, Mich.:				
Black bass, largemouth			6, 600	6, 600
Black bass, smallmouth			44, 000	44, 000
Brook trout			763, 185	763, 185
Rainbow trout			227, 500	227, 500
Sunfish			64, 300	64, 300
Orangeburg, S. C.:				
Black bass, largemouth		11, 500	355, 430	366, 930
Catfish			1, 720	1, 720
Crappie			2, 560	2, 560
Sunfish			160, 500	160, 500
Warmouth bass			18, 870	18, 870
Pittsford, Vt.:				
Blackspotted trout			7, 100	7, 100
Brook trout			57, 260	57, 260
Grayling			2, 185	2, 185
Rainbow trout			175, 470	175, 470
Put in Bay, Ohio:				
Pike perch	548, 480, 000			548, 480, 000
Whitefish		32, 680, 000		32, 680, 000
Quinalt, Wash.:				
Blackspotted trout			367, 500	367, 500
Brook trout			217, 200	217, 200
Chinook salmon		21, 240	12, 510	33, 750
Sockeye salmon		11, 038, 000	3, 765, 000	14, 803, 000
Duckabush, Wash.:				
Chum salmon		7, 342, 000		7, 342, 000
Silver salmon		70, 700	92, 700	163, 400
Quilcene, Wash.:				
Blackspotted trout			366, 000	366, 000
Brook trout			198, 900	198, 900
Chum salmon		6, 797, 000	9, 070	6, 806, 070
Silver salmon		273, 800	464, 700	738, 500
Steelhead trout			153, 000	153, 000
San Marcos, Tex.:				
Black bass, largemouth		34, 000	151, 060	185, 060
Crappie			28, 980	28, 980
Sunfish			91, 430	91, 430
Ft. Worth, Tex.:				
Black bass, largemouth			44, 625	44, 625
Catfish			6, 050	6, 050
Crappie			13, 725	13, 725
Sunfish			19, 750	19, 750
San Angelo, Tex.:				
Black bass, largemouth			28, 065	28, 065
Crappie			13, 100	13, 100
Sunfish			4, 000	4, 000

Stations and substations operated and the output of each, fiscal year 1936—Contd.

Stations, substations, and species	Eggs	Fry	Fingerlings	Totals
Saratoga, Wyo.:				
Blackspotted trout.....			510, 100	510, 100
Brook trout.....			953, 720	953, 720
Loch Leven trout.....			558, 100	558, 100
Rainbow trout.....			372, 770	372, 770
Spearfish, S. Dak.:				
Blackspotted trout.....			85, 320	85, 320
Brook trout.....			847, 000	847, 000
Grayling.....		90, 000		90, 000
Loch Leven trout.....			236, 700	236, 700
Rainbow trout.....			630, 450	630, 450
Springville, Utah:				
Blackbass, largemouth.....			2, 515	2, 515
Blackspotted trout.....			470, 300	470, 300
Brook trout.....			288, 000	288, 000
Golden trout.....			11, 100	11, 100
Grayling.....	125, 000		22, 700	147, 700
Loch Leven trout.....			334, 000	334, 000
Rainbow trout.....	500, 160		705, 080	1, 205, 240
Sunfish.....			15, 500	15, 500
Bear Lake, Utah:				
Brook trout.....			404, 600	404, 600
Rainbow trout.....			67, 100	67, 100
Silver salmon.....			124, 100	124, 100
White Sulphur Springs, W. Va.:				
Black bass, largemouth.....			350	350
Brook trout.....			675, 530	675, 530
Loch Leven trout.....			383, 450	383, 450
Rainbow trout.....	405, 000		1, 329, 700	1, 734, 700
Rock bass.....			3, 300	3, 300
Sunfish.....			87, 730	87, 730
Woods Hole, Mass.:				
Flatfish.....		400, 571, 000		400, 571, 000
Mackerel.....		1, 234, 000		1, 234, 000
Wytheville, Va.:				
Black bass, largemouth.....			2, 410	2, 410
Black bass, smallmouth.....			3, 560	3, 560
Brook trout.....			335, 530	335, 530
Rainbow trout.....	1, 550, 000		743, 500	2, 293, 500
Rock bass.....			23, 620	23, 620
Sunfish.....			54, 900	54, 900
Harrison Lake, Va.:				
Black bass, largemouth.....		86, 000	10, 200	96, 200
Yellowstone Park, Wyo.:				
Blackspotted trout.....	9, 696, 000		5, 280, 000	14, 976, 000
Grayling.....	225, 000	4, 810, 500		5, 035, 500
Moose, Wyo.:				
Blackspotted trout.....		43, 500	530, 420	573, 920
Brook trout.....			63, 150	63, 150

EGG COLLECTIONS

As might be expected the increase in the collection of eggs was roughly proportional to the augmented output of the species which are incubated artificially. The Bureau's egg supply is obtainable from three sources: Trout eggs are obtained from a brood stock maintained at the hatcheries or by collections from wild fish captured during their spawning migrations. The second source, and the greatest numerically, is the activities of the commercial fishermen, which yields eggs of such varieties as shad, cod, haddock, whitefish, pike perch, and lake trout. The eggs of the Pacific salmon are obtained in still a different manner, being taken by the Bureau's employees as the fish approach the spawning grounds after having eluded the nets and traps of the commercial fishermen. Many of the eggs, therefore, are in the nature of a byproduct.

Comparison of egg collections, fiscal years 1935 and 1936

Species	1935	1936	Species	1935	1936
Shad.....	5,280,000	22,123,000	Pike perch.....	519,075,000	536,845,000
Whitefish.....	54,895,000	59,970,000	Yellow perch.....	14,000,000	324,166,000
Chinook salmon.....	29,919,000	75,282,000	White perch.....	2,400,000	
Chum salmon.....	21,138,000	19,703,000	Cod.....	1,753,129,000	3,956,886,000
Silver salmon.....	3,398,000	4,487,000	Haddock.....	264,483,000	430,109,000
Sockeye salmon.....	3,326,000	16,262,000	Pollock.....	523,622,000	1,462,985,000
Steelhead trout.....	1,352,000	2,547,000	Flounder.....	1,375,129,000	1,634,507,000
Rainbow trout.....	21,365,920	24,154,000	Mackerel.....	2,800,000	1,796,000
Blackspotted trout.....	21,206,000	40,879,000	Lake herring.....	5,520,000	6,760,000
Lock Leven trout.....	30,372,000	15,757,000	Carp.....	83,250,000	1,500,000
Lake trout.....	2,684,000	1,573,500	Buffalo fish.....	214,046,000	13,912,000
Brook trout.....	29,265,500	27,123,800			
Grayling.....		3,918,000	Total.....	4,981,655,420	8,683,260,500

NOTES ON OPERATIONS

COMMERCIAL SPECIES

Pacific salmon.—Headquarters for the work in both the Pacific Coast States and the Rocky Mountain section were transferred to Seattle, Wash., at the start of the fiscal year. The propagation of the Pacific salmon yielded much better results than during the previous year. A noticeable increase in the two most valuable species, the chinook salmon and the sockeye salmon, was registered. No pink salmon were propagated and the chum variety was handled in smaller numbers.

The augmented output of chinook salmon was due to a record run of fish at the Big and Little White Salmon, Wash., substations. Collections were made to the full capacity of these establishments and enough fish were available to yield a collection of approximately 45,000,000 eggs. It is particularly important to increase the production of this variety, due to the changes which will occur in the Columbia River following the completion of the Bonneville Dam. In fact, these two stations will be partly flooded when the dam is completed and plans are being made for their relocation at other points where the work can be continued with the same efficiency and trout may be handled in addition.

The facilities of the main station at Clackamas, Oreg., were improved by the action of the State of Oregon in transferring to the Bureau the hatchery property located at Delph Creek, a few miles away. This will be used to rear trout and salmon during the summer months when the water supply at the station is inadequate. The fish cultural work at Clackamas proceeded along normal lines otherwise. The station is constantly increasing its production of game trout, however.

In the California field no effort was made to collect eggs at the Baird station due to the uncertain results and the cost involved. A million and a half chinook salmon eggs were transferred for incubation from the Battle Creek substation. Total collections at that point amounted to 8,500,000, approximating a normal take under existing conditions. At the Mill Creek substation egg collections amounted to 4,500,000.

In the Olympic Peninsula the output of sockeye from the Quinault, Wash., station again resumed normal proportions, approximating 13,000,000. Some new rearing ponds were constructed by E. C. W.

labor. Here, too, the output of trout was increased in conformity with the program of augmenting the production of game fish at these salmon hatcheries.

The two substations located at Duckabush and Quilcene, Wash., concentrated on the propagation of chum salmon. A large number of these eggs are easily obtainable and are incubated at both stations. The most important factor here was the construction of a fish food dehydrating plant at Quilcene. This is used in preparing fish meal from the spawned-out chum salmon, and a considerable quantity of this material was turned out at a cost of approximately $4\frac{1}{2}$ cents per pound. The salmon propagation is likewise being supplemented by concentrating on the production of game trout during the summer months.

At the Birdsvie, Wash., station, the total egg collections were almost four times as great as during the previous year. Almost a million trout eggs of various species were incubated. However, the run of steelhead was noticeably below the level of previous years. Experiments in the marking of sockeye salmon fingerlings were continued and numerous returns are being secured from the fish which were marked, commencing in the fall of 1929.

The Baker Lake station operated only for the purpose of incubating trout eggs during the summer months. However, it was reported that the run of sockeye and silver salmon in the Baker River was the largest for a number of years.

While the two additional substations under the administration of the Birdsvie station are concerned entirely with the propagation of trout, it is appropriate to mention that the Mount Rainier substation has now been developed to the point where it is an important factor in maintaining the stock of fish in the park and in the adjoining National Forest areas. Efforts are being made to collect eggs of the cut-throat trout from certain lakes in the park which had been previously stocked with this object in mind.

The other establishment, a series of rearing ponds outside of the city of Spokane, Wash., was placed in operation during the year. Over 500,000 trout and graylings ranging up to 6 inches in size were distributed.

MARINE SPECIES

It has been mentioned elsewhere that there was general expansion of activities at the three New England hatcheries engaged in propagating cod, haddock, pollock, and other varieties supporting the inshore commercial fisheries.

At Gloucester, Mass., a considerable number of spawn-takers were placed aboard local fishing vessels and a tremendous number of pollock eggs were fertilized and planted by this means. Of the 3,000,000,000 cod eggs secured, slightly over 300,000 were propagated at the hatchery, the balance being planted after fertilization on the spawning grounds. Haddock work was relatively unsuccessful at this point. Some propagation of lobster was resumed on an experimental basis. Considerable work was required during the year in the maintenance of the property and equipment due to deterioration during the period of closure.

A Diesel-powered launch was transferred from the Cape Vincent, N. Y., station to Gloucester as a tender.

The Woods Hole, Mass., station made no attempt to propagate cod, and its operations with the winter flounder were seriously hampered by the severe winter. A considerable proportion of the 400,000,000 fry hatched were distributed in the waters of Long Island Sound. The personnel of this station has as usual expended considerable effort in maintenance of the extensive plant, also in assisting in the laboratory work conducted by the Division of Scientific Inquiry during the summer.

At the Boothbay Harbor, Maine, station, following the installation of a new electric pump, considerable overhauling and changing of the piping system was necessary. Severe winter conditions also affected the propagation of flat fish or flounder during the early part of the season. Later results were more favorable, yielding a production of 1,000,000,000 fry. The propagation of cod exceeded that of the previous year. Haddock operations were a minor activity in connection with other major work.

For some years there has been frequent expression of doubt as to the exact value of propagating marine species. This activity is now increasing in popularity and if carried on as an adjunct to commercial fishing operations and not as an end in itself, it appears highly justifiable.

GREAT LAKES SPECIES

With the exception of the Put in Bay, Ohio, station, the handling of the commercial species of the Great Lakes is at a low ebb. Changes in the fishing season in Michigan waters several years ago virtually eliminated the production of whitefish and lake trout at the Michigan hatcheries and at the Duluth, Minn., station.

At the Cape Vincent, N. Y., station, changes in the spawning habits of the fish, particularly concentration in Canadian waters, have greatly reduced the potential egg supply. Consequently, these stations have either been closed or are emphasizing the production of game fish, the commercial varieties being handled as a side line.

The Duluth, Minn., station handled less than a million lake trout and whitefish eggs, but incubated a considerable number of game trout eggs for transfer to rearing stations in the national forests.

During the spring, in cooperation with the State of Minnesota, approximately 10,000,000 pike perch were hatched.

The Put in Bay, Ohio, operations are on a joint basis with the State of Ohio. The Bureau is supervising the collection of the eggs at designated areas and the hatching is being carried on in the nearby State hatchery with the assistance of the Bureau's personnel. The Federal hatchery, however, is maintained in readiness to handle any excess quantity of eggs which might be beyond the capacity of the State establishment. Our egg collections for the year exceeded 52,000,000 whitefish and 500,000,000 pike perch.

The activities of the Cape Vincent, N. Y., station, as regards propagation of game fish and operations of its substations, will be discussed elsewhere in this report. An output of whitefish and lake herring slightly better than last year was obtained. Over 1,000,000 lake trout eggs were also secured from local fishermen. The production at this point could be moderately increased were funds available for the hiring of an adequate number of spawn-takers.

ANADROMOUS SPECIES OF THE ATLANTIC COAST

Atlantic salmon, yellow perch, and shad are the varieties which are propagated for the maintenance of fisheries in the rivers of the East coast. It was possible to obtain from the Canadian Government 1,500,000 Atlantic salmon eggs in comparison with the usual assignment of only 1,000,000. Two-thirds of these were assigned to various hatcheries operated by the State of Maine in conformity with an agreement covering this work. The State attended to the major part of the distribution of the resulting fry and fingerlings. Gratifying reports were received as to the run of salmon in the Penobscot River, and the improvements being made to the fish ways in this river encourage the belief that conditions will be even better in the future.

At the Fort Belvoir, Va., hatchery on the Potomac River, the main activities with shad were conducted. The take of eggs and production of fry were slightly greater than during the previous year. Funds were available to permit the resumption of hatching yellow perch and over 400,000,000 fry of this species were planted locally at very slight cost.

The Edenton, N. C., station likewise reported slightly better results with the shad, taking 4,750,000 eggs. The rigorous winter prevented the collection of yellow perch brood stock at the time when they were spawning and there was consequently no production of this species, or of the white perch. Increasing difficulty is being met in securing shad eggs here because of the fact that the commercial fishery is centered further down in Albemarle Sound and the fish are not ripe when taken. The Edenton station carries on considerable propagation of pond fish, supplementing its work with the commercial varieties.

The cooperative work with the State of South Carolina, whereby the Orangeburg, S. C., station propagates shad at Jacksonboro, was continued, but results failed to meet expectations. Slightly less than 1,000,000 fry were produced, the work being seriously hampered by floods during the spawning season. Special attention is being given to the experimental rearing of shad, and a number of the fry were held in ponds at the close of the year.

GAME FISH PROPAGATION

There was a moderate increase in the output of game fish produced in the interior hatcheries. Some confusion exists as to the exact status of these hatcheries, since the rapid expansion of State fish cultural activities has raised the question of duplication or competition with the Federal hatcheries. The fact is, the demand for game fish is greatly in excess of all current facilities for producing them. Should the Bureau discontinue entirely the stocking of all waters except those directly under Federal jurisdiction, there would still be an outlet for the entire production of all but a half-dozen of the Federal hatcheries in the interior. National parks, national forests, Resettlement projects, the Tennessee Valley Authority, and similar Federal projects constitute a definite obligation upon practically all of the existing hatcheries and present a need for new hatcheries, or at least additional rearing facilities.

The trend toward rearing game fish to larger size before stocking has been recognized, but the continued high cost of fish food has pre-

sented a real obstacle to the full accomplishment of this objective.

The cooperation of applicants, States, and other Federal agencies in distributing the fish has released greatly needed funds to be applied to production.

There follows a brief outline of the nature and scope of game fish propagation in the various geographical sections.

ROCKY MOUNTAIN TERRITORY

Activities at the Yellowstone Park, Wyo., station overlap the end of the fiscal year and consequently seasonal reports are based upon parts of two fiscal years. For the season of 1934 the egg collections totaled over 30,000,000, somewhat less than during the previous year. The reduction was due chiefly to high water which made it impossible to maintain all of the traps throughout the season. There was a slight decrease in the collection of grayling eggs. Of the total trout egg collection, 65 percent were used to restock Park waters, in comparison with the 60 percent which is the basis of the agreement with the Park Service covering these operations.

Conditions at the Jackson Hole, Wyo., substation serving the Teton National Park were unsatisfactory. An undue amount of disease was encountered and at the close of the fiscal year preparations were being made to transfer the hatchery to a new site on Government owned land under the jurisdiction of the United States Forest Service, where a superior water supply will be available. Efforts are being made to secure local egg-collecting facilities at one of the lakes in that territory. An unusual feature here is the use of elk meat for fish food. This meat is secured from animals which are culled out of the herd due to age, weakened condition, etc.

The Spearfish, S. Dak., station enjoyed a very successful year, having distributed a large number of 3- and 4-inch fingerlings to private applicants and to the United States Forest Service. Among the improvements the major item is the construction of a stone garage as a W. P. A. project. The station was equipped with a new distribution truck. At the close of the year arrangements were being made for the construction of a new hatchery building, this, also, to constitute a W. P. A. project.

Operations at the Glacier Park hatchery were comparable to former years but considerable difficulty was experienced in the water supply system, which repeatedly was clogged with gravel. The necessity for a new and improved hatchery for Glacier Park is realized, and an alternative location is under consideration, but development will necessarily await the securing of an appropriation for purchase of the site and for the construction work.

The Saratoga, Wyo., station made a very satisfactory showing, both in the distribution of fingerlings and in the take of eggs from station brood stock. Some work was performed in improving the station ponds and grounds through C. C. C. detail.

In Colorado the work of the substation at Creede is fast becoming of importance equal to that of the older establishment at Leadville. The latter station distributed over 3,800,000 trout and handled a much larger number of eggs. Egg collections at Lake San Cristobal in the Creede territory represented an increase, 2,500,000 brook trout eggs and 750,000 rainbows having been secured. These eggs are of unusually high quality, 97 percent to 99 percent reaching the eyed stage.

A new dwelling has been made ready for occupancy at the Creede station.

An average production of trout and trout eggs was obtained at the Springville, Utah, station, and in addition thereto a few bass and bream were propagated. The number of fish handled at the Bear Lake, Utah, substation was reduced by about 50 percent, in the belief that a reduction of crowding would relieve the mortality. This was found to be the case and a very creditable output achieved in spite of the smaller number of eggs handled.

The important work in the Montana territory was centered at the Bozeman station, where a duplex dwelling was completed. Several rearing ponds were constructed and improvements made to the station's water supply. Shipments of trout eggs amounted to almost 10,000,000, and 2,800,000 fingerlings were distributed.

In the Madison Valley adverse weather conditions caused an early cessation of Loch Leven egg collections and the take of 14,000,000 was 10,000,000 less than during the previous year. However, collections of spring rainbow eggs were increased. One-half mile of telephone line was constructed for the purpose of affording this substation outside connections.

At the Miles City, Mont., substation devoted to the propagation of warm water fish, 350,000 fingerlings of various species were produced. The production of fingerling bass was approximately 50,000 over that of last year.

A liberal grant of W. P. A. labor at the Hagerman, Idaho, station permitted extensive repairs and improvements, including the construction of ponds and general improvements to the buildings. A very large percentage of the fingerling trout used at this station are from 3 to 6 inches in length when liberated. Rainbow trout eggs are now being obtained from brood stock produced at the station.

The Salmon, Idaho, station was operated jointly with the State of Idaho and served as a base for rainbow egg collection operations at Williams Lake. Over 3,000,000 were secured from this source and the hatching and rearing was handled at the above-mentioned hatchery. Four rearing ponds were built on state property adjoining this establishment.

The Dexter, N. Mex., station is in an entirely different category than other stations in the Rocky Mountain territory due to the fact that it propagates warm-water fish exclusively. Heavy losses of brood stock from the depredations of fish-eating birds affected the production somewhat. However, there was a good hatch of bass which made it possible to distribute 200,000 fingerlings in June and still reserve an adequate number for later distribution.

NEW ENGLAND STATIONS

With the increasing importance of New England as a vacation center the pressure upon the game fish hatcheries in that section is increasing. In Maine the Craig Brook station handled a slightly smaller number of brook trout due to a reduction in the brood stock. The State of Maine also made a reduced allotment of landlocked salmon eggs, furnishing only 100,000. Work with the Atlantic salmon is discussed elsewhere. Considerable trouble was experienced during the year with the water supply dam providing the main supply for the hatchery and a break late in May necessitated complete rebuilding. Arrangements were formulated with the National Park Service

whereby that agency will assign C. C. C. labor for the construction of a number of rearing ponds on the station property. These will be used to rear fish exclusively for the waters of the Acadia National Park. It is expected that a number of other improvements will be effected in connection with this program.

The Nashua, N. H., station was subjected to the ravages of the spring floods which virtually wiped out the supply of trout fingerlings on hand. The entire hatchery reservation was flooded and while a few fish were salvaged it was necessary to ship in brook trout fry from other hatcheries in order to secure a greatly reduced output of fish for distribution.

The St. Johnsbury, Vt., and York Pond, N. H., stations were separated administratively, the former being now independent of the field operations at York Pond. At St. Johnsbury unusually good results were obtained in the rearing of landlocked salmon from eggs supplied by the State; 65,000 yearlings were produced, some of them reaching 9 inches in length. The output of brook trout was curtailed due to the poor quality of the eggs transferred from York Pond. Considerable improvements were attempted by W. P. A. allotment. The foundations of several of the buildings were repaired, painting was done, and the drain line to the ponds was renewed. A new heating plant was installed in the hatchery building.

At York Pond there was a combination of unfavorable circumstances which caused a heavy loss of brook trout brood stock, followed by an outbreak of the "soft egg" disease, which makes sporadic appearance, particularly in the New England hatcheries. In consequence the output of fry and fingerlings at this station was below normal and shipments of eggs to other hatcheries produced very unsatisfactory results. The development program continued by virtue of C. C. C. labor and a W. P. A. project. The pond system has been improved and a new well furnishing 100 gallons per minute was developed. The water supply canal to the power-house has been virtually rebuilt. A large ice storage building was constructed, and numerous minor improvements all contributing to the efficiency of the plant have been completed. Experiments in determining cheaper fish foods presented some interesting information but no definite conclusions have been reached as yet.

At the Hartsville, Mass., station operations were of a routine nature with the exception that unusually favorable results were obtained in the collection of smallmouth bass fry in Connecticut, in cooperation with the State Board of Fisheries and Game. Over 840,000 fry were handled. The collection of brook trout eggs from station stock amounted to over 400,000 and a considerable number of excellent fingerlings, ranging up to 6 inches in length, were placed in local waters. No significant improvements or expansions could be carried on during the year.

COMBINATION TROUT AND POND-FISH STATIONS

Most of the establishments in this category are primarily concerned with the propagation of trout, and the production of warm water pond fish is a side line or by-product. At the Manchester, Iowa, station the year's operations were of normal extent. The station brood stock yielded over 2,000,000 rainbow trout eggs and the eggs of other species shipped in produced a quantity of fingerlings adequate for all

requirements in that section. The output of smallmouth bass was reduced as to numbers but included a considerable proportion of larger fish. The fish culturist's residence, gutted by fire during the previous year, was rebuilt.

The incomplete status of the pond development program at the Flintville, Tenn., station served to limit the production at that point. Trout of two varieties were produced in numbers fully sufficient to meet requirements in that territory but the inadequate pond space and insufficient brood stock of warm-water varieties was reflected in a negligible production, particularly of bass.

The Neosho, Mo., station reports an unusually favorable season, the sole serious handicap being the loss of several hundred rainbow brood stock due to the severing of a water supply pipe line during road repairs. Attacks of disease were negligible among the rainbow trout. Studies in selective breeding as well as experiments with fish foods were among the important activities at Neosho. Largemouth bass were produced in much greater quantities than during the previous year.

At the Bourbon, Mo., substation, operated on a cooperative basis for the sole purpose of producing rainbow eggs, there was a definite increase in the yield.

The scientific and investigative activities of the Leetown, W. Va., station are the subject of report elsewhere. So far as productive fish cultural work is concerned, the station handled over 2,750,000 trout eggs. Abnormal losses were experienced both among the eggs and fry, due to conditions which have not been satisfactorily determined. Many of the fingerling trout were used in restocking the national forest areas in Virginia and West Virginia. The station bass cultural operations were fairly successful with the production of over 30,000 smallmouth fingerlings in spite of the fact that the ponds were new and leaked badly. A set of raceways were provided with a concrete lining in order to prevent damage to surrounding property through seepage.

The White Sulphur Springs, W. Va., station functioned in a normal manner, cooperating extensively with the State of West Virginia.

The demonstration hatchery conducted jointly by the Bureau and Monroe County, N. Y., near the city of Rochester produced a very satisfactory output of trout fingerlings used extensively in stocking the waters under the control of the county park authorities. A few thousand bass were also obtained.

The Cape Vincent, N. Y., station, together with its substations at Cortland, Watertown, and Barneveld contributed heavily toward the restocking of the trout waters in northern and central New York. Approximately 50,000 smallmouth bass fingerlings were produced in the four acres of ponds available for this purpose.

The most outstanding feature in connection with the work of the Northville, Mich., station was the excellent results obtained at the various cooperative rearing stations maintained during the summer months under the direction of this station. Over 50,000 bass were also produced at Northville, with larger numbers of brook.

The Wytheville, Va., station was the source of a large number of rainbow trout which were used in stocking forest service and national park waters in that territory. The collection of rainbow eggs amounted approximately to 2,500,000. The production of pond fish here was insignificant. Supervised by the superintendent of the Wytheville

station, the construction of the new hatchery in the Smoky Mountain National Park proceeded rather slowly due to its isolated location and other factors. At the close of the year the National Park Service had constructed 17 rearing pools and the water supply system had been installed. A hatchery building and a service building were about two-thirds completed and work was progressing on the construction of a residence. In spite of the incomplete status of the project it was possible to handle rainbow trout fingerlings in the rearing ponds during the latter part of the year.

The Lamar, Pa., hatchery received brook and rainbow trout fingerlings transferred from other establishments and reared them over the summer months for fall distribution. Development work has consisted in the construction of additional circular rearing pools, the work being performed by C. C. C. detail.

POND-FISH STATIONS

The majority of these establishments located in the southeastern and south central sections maintained previous records of output and in some instances materially bettered the production of last year. The Mammoth Spring, Ark., station supplied a much larger proportion of its production of bass to the waters of the National Forests in Arkansas and Missouri. 100,000 bass fry were transferred to the State hatchery at Lonoke on a cooperative rearing basis.

The Department of Fish and Game of the State of Georgia assumed full responsibility for the distribution of fish produced at both of the Bureau's Georgia stations. At the Lake Park, Ga., substation the initial use of a new water supply permitted the handling of the propagating pond to much better advantage. However, the actual distribution of fish during the fiscal year 1936 was slight due to the fact that construction work had been under way during the greater part of the year. Conditions at the close of the fiscal year indicated a very satisfactory production during the pending distribution season. W. P. A. labor was largely employed in effecting the foregoing improvements and in maintaining the station property.

The new Harrison Lake, Va., station was on a full productive basis during the year, utilizing 12 large ponds and several small minnow and daphnia ponds. Almost 100,000 bass had been distributed by the close of the year, with a considerable number of fingerlings remaining, as well as a good stock of bream. Severe rains necessitated considerable repair work where the new pond embankments had become eroded. Brood stock was obtained from Harrison Lake which is used as the water supply for the hatchery.

The Tupelo, Miss., station escaped damage from the terrific tornado which visited that section and produced an output of bass approaching previous high records for this hatchery. The production of bream was somewhat reduced, however, due to consumption of the bream fry and fingerlings by the bass.

Inadequacy of brood stock curtailed the production of smallmouth and largemouth bass at the Louisville, Ky., station below the normal average. However, the output was in excess of the previous year. Relief labor is employed extensively at this point in improving the pond system, including the closure of leaks and the renewal of drain and supply lines.

No construction work of any importance was carried on at the Marion, Ala., station, but the output of bass was increased more than 100 percent over last year. A total of over 500,000 bass were handled which, together with the bream, constituted a hatch of more than 1,000,000 total. An unusually good growth was obtained for the bream, a number being 4 inches in length when distributed. Some research work was conducted through the assignment of an investigator to the Marion station but conditions were found to be unsatisfactory for this activity and the program was discontinued at the close of the year.

The Edenton, N. C., station doubled its output of bream and attained a normal yield of bass.

By thorough cleaning of the brood ponds the production at the Orangeburg, S. C., station was increased by approximately 125,000 fish. The removal of the profuse vegetation was most effective in securing this result. The superintendent cooperated in the development of a small auxiliary located a few miles from the main station.

In Texas both of the older stations, located at San Marcos and at Forth Worth, operated in a normal manner with average results. No major changes or improvements were effected. At the new San Angelo, Tex., establishment fish were reared for the first time. Fry were transferred from Fort Worth and San Marcos and reared during the summer months, the total distribution amounting to 47,000 fish.

Work at the new Uvalde, Tex., substation was actively under way from September to the close of the year. The accomplishments included partial completion of two residence buildings, garage, holding shed, and store room. An office and shop building was completed. Nine ponds were virtually finished and a number of others carried well along. A considerable amount of clearing was accomplished; roads and walks were constructed and a pump installed to provide the water supply from a driven well.

At the Natchitoches, La., station a W. P. A. project was perfected and work was started on the development of additional ponds. Six new ponds, each of 2 acres area, were completed. The production of fish was much more extensive than during previous years.

The Tishomingo, Okla., station likewise surpassed the production of the previous year. An interesting feature of the work here was the production of channel catfish.

MISSISSIPPI RIVER TERRITORY

The headquarters for the work in the Mississippi Valley located at La Crosse, Wis., is the center for a number of varied activities. During the past year in addition to the hatching and distributing of over 1,000,000 trout, the La Crosse station supervised the salvage of over 47,000,000 fish from the overflow pools in the Upper Mississippi Wild Life Refuge.

Attention should again be called to the fact that upon completion of the 9-foot channel project the characteristics of the pools to be formed will be such that the rescue work will recede to approximately 5 percent of its present proportions. Greater attention is being given to the establishment of controlled, propagating ponds to provide a source of fish in lieu of the salvaged stock. Three of such ponds were operated during the year, and construction is under way at an addi-

tional one. Plans have already been prepared for additional ponds to be constructed as W. P. A. projects, with an ultimate objective of over 400 acres under water.

The Homer, Minn., station was continued in operation as a base for rescue work, and also as a center for overhauling and repairing equipment, boats, trucks, etc.

A limited amount of W. P. A. work was performed at the Lake Mills, Wis., station, resulting in some improvements to the ponds and grounds. An unfavorable spawning season apparently reduced the production of pond fish, less than 50,000 having been secured. Several hundred thousand trout were produced for stocking waters which can be most readily served from this hatchery.

At the Rochester, Ind., station, work was under way during the greater part of the year on the construction of additional ponds as a W. P. A. project. Three ponds were carried to various stages of completion. A fairly successful production of bass and other species was secured and distributed by the State of Indiana. At the same time an auxiliary station at Argos, about 20 miles from Rochester, was being developed, likewise under W. P. A. auspices. This will comprise 5 ponds fed by flowing wells, and 1 building. The drought affected the water supply at the Rochester station necessitating a distribution of the fish earlier than would be preferred.

Activities at the Fairport, Iowa, station were along routine lines, with the production of pond fish running close to normal. In addition some 900,000 fish were salvaged from nearby, overflowed areas, and carp and buffalo eggs were obtained from nearby commercial fisheries and were replanted in local waters after fertilization.

AQUARIUM

The Bureau of Fisheries Aquarium is located under the main lobby of the Department of Commerce Building.

Its display consists of about 1,600 specimens of some 54 species of aquatic animals. Stress is laid particularly on the fresh water game and food fish, and on the most common predators. The greatest single attraction was the seasonal miniature hatchery. Biology students in and near Washington made regular visits when the eggs were hatching.

Cooperation with other public aquaria in the exchange and supply of specimens was a feature of the work. The Aquarium was used as a base for the distribution of fish for the stocking of public waters. A special effort was made to develop more natural habitat conditions in the decoration of the tanks. Considerable success was achieved in the study and control of surface parasites on fish which seemed especially prevalent in this territory this season.

The aquarium has, in brief, served as a most interesting show room or "sample room" for demonstrating the products of the Bureau's hatcheries.

DISTRIBUTION OPERATIONS

The number of applications supplied this year shows a considerable increase over 1935, which is probably accounted for largely by the growing use of trucks for making deliveries. Truck mileage was nearly double that of the previous year.

The distribution cars engaged in the delivery of fish to applicants and transfers between hatcheries this year made 75 trips and carried

an average of 250 pails per trip. The cars traveled 48,014 paid miles and 7,329 free miles in delivering fish to applicants. Detached messengers made 56,064 paid miles and 8,404 free miles. Truck deliveries covered 81,009 miles, the trucks being used for short trips and the cars for longer hauls. As usual, the Bureau received free transportation and reduced rates from a number of railroads.

Owing to the prevailing limited funds for distribution purposes, the practice of asking applicants to call at the hatcheries if possible, to receive their fish had to be continued. Upon their failure to do so the applications which could not be filled by messenger were carried over for another attempt to make delivery the following season.

Summary, by States, of the distribution of fish, fiscal year 1936

State and species	Number	State and species	Number
Alabama:		Indiana—Continued.	
Largemouth black bass.....	415,657	Sunfish.....	310,520
Sunfish.....	452,885	Catfish.....	12,400
Catfish.....	140	Yellow perch.....	8,600
Lochleven trout.....	51,000	Brook trout.....	89,300
Arizona:		Rainbow trout.....	89,850
Black bass.....	3,840	Lochleven trout.....	292,600
Sunfish.....	15,960	Iowa:	
Arkansas:		Largemouth black bass.....	194,245
Largemouth black bass.....	144,450	Smallmouth black bass.....	9,110
Smallmouth black bass.....	197,725	White bass.....	10,300
Rock bass.....	11,000	Crappie.....	9,670,485
Sunfish.....	68,825	Catfish.....	3,728,750
Rainbow trout.....	900	Sunfish.....	8,698,300
California: Chinook salmon.....	10,572,413	Buffalo fish.....	1,101,400
Colorado:		Drum.....	1,444
Largemouth black bass.....	15,000	Yellow perch.....	88,319
Rock bass.....	5,600	Pike and pickerel.....	45,102
Crappie.....	4,000	Brook trout.....	92,900
Catfish.....	28,000	Rainbow trout.....	1,170
Brook trout.....	4,519,610	Kansas:	
Rainbow trout.....	1,349,544	Largemouth black bass.....	4,850
Blackspotted trout.....	1,200,000	Rock bass.....	1,880
Lochleven trout.....	329,520	Catfish.....	2,000
Connecticut:		Sunfish.....	5,200
Smallmouth black bass.....	315,200	Rainbow trout.....	1,025
Rainbow trout.....	9,000	Kentucky:	
Brook trout.....	3,000	Largemouth black bass.....	21,275
Delaware:		Smallmouth black bass.....	78,510
Largemouth black bass.....	9,290	Rock bass.....	4,510
Crappie.....	5,100	Crappie.....	150
Sunfish.....	8,375	Sunfish.....	2,800
District of Columbia: Largemouth		Louisiana:	
black bass.....	15	Largemouth black bass.....	213,504
Florida: Sunfish.....	2,375	Warmouth bass.....	8,400
Georgia:		Sunfish.....	14,538
Largemouth black bass.....	297,227	Maine:	
Smallmouth black bass.....	81,125	Smallmouth black bass.....	66,100
Catfish.....	8,339	Brook trout.....	968,002
Sunfish.....	749,950	Landlocked salmon.....	404,500
Brook trout.....	6,500	Atlantic Salmon.....	578,050
Rainbow trout.....	26,390	Flounder.....	1,015,200,000
Idaho:		Maryland:	
Sunfish.....	7,700	Largemouth black bass.....	4,379
Brook trout.....	62,735	Smallmouth black bass.....	7,977
Rainbow trout.....	1,423,450	Sunfish.....	53,915
Blackspotted trout.....	1,672,580	Brook trout.....	21,932
Lochleven trout.....	52,000	Rainbow trout.....	11,410
Steelhead trout.....	46,500	Lochleven trout.....	15,700
Illinois:		Chinook salmon.....	2,400
Largemouth black bass.....	31,525	Silver salmon.....	3,000
Buffalo fish.....	5,825	Massachusetts:	
Carp.....	4,500	Smallmouth black bass.....	239,200
Catfish.....	20,735	Catfish.....	1,800
Crappie.....	54,550	Brook trout.....	129,657
Sunfish.....	57,225	Rainbow trout.....	1,530
Yellow perch.....	1,600	Lochleven trout.....	10,000
Lochleven trout.....	6,000	Landlocked salmon.....	6,000
Indiana:		Cod.....	261,662,000
Largemouth black bass.....	88,535	Flounder.....	283,619,000
Smallmouth black bass.....	48,200	Haddock.....	9,588,000
Rock bass.....	22,000	Pollock.....	475,457,700
Crappie.....	1,825	Mackerel.....	767,000

Summary, by States, of the distribution of fish, fiscal year 1936—Continued

State and species	Number	State and species	Number
Michigan:		New Mexico—Continued.	
Largemouth black bass.....	7,995	Blackspotted trout.....	55,000
Smallmouth black bass.....	40,050	Brook trout.....	16,000
Rock bass.....	2,650	Rainbow trout.....	239,000
Sunfish.....	77,500	New York:	
Brook trout.....	1,326,375	Largemouth black bass.....	6,200
Rainbow trout.....	357,702	Smallmouth black bass.....	113,402
Lake trout.....	192,500	Crappie.....	60
Minnesota:		Catfish.....	1,600
Largemouth black bass.....	218,175	Flounder.....	142,465,000
Smallmouth black bass.....	1,310	Lake Herring.....	2,740,000
Crappie.....	1,763,100	Whitefish.....	3,125,000
Sunfish.....	1,002,335	Brook trout.....	330,742
Catfish.....	75,800	Rainbow trout.....	101,860
Carp.....	12,000	Lochleven trout.....	188,243
Drum.....	1,900	Landlocked Salmon.....	42
Pike perch.....	9,670,000	Lake trout.....	570,535
Yellow perch.....	4,184	North Carolina:	
Pike and pickerel.....	404,150	Largemouth black bass.....	87,858
Buffalo fish.....	100	Smallmouth black bass.....	1,000
White bass.....	2,400	Rock bass.....	13,400
Whitefish.....	1,275,000	Crappie.....	900
Brook trout.....	221,200	Sunfish.....	44,740
Rainbow trout.....	70,550	Yellow perch.....	385
Lochleven trout.....	71,600	Warmouth bass.....	1,855
Lake trout.....	64,000	Shad.....	2,000,000
Miscellaneous fishes.....	508,000	Brook trout.....	111,950
Mississippi:		Rainbow trout.....	547,635
Largemouth black bass.....	323,865	North Dakota:	
Sunfish.....	189,875	Largemouth black bass.....	5,082
Missouri:		Crappie.....	64,776
Largemouth black bass.....	210,235	Sunfish.....	36,270
Smallmouth black bass.....	35,140	Catfish.....	1,200
Rock bass.....	17,195	Rainbow trout.....	9,000
Crappie.....	7,600	Lochleven trout.....	15,000
Sunfish.....	31,300	Ohio:	
Catfish.....	1,125	Largemouth black bass.....	28,929
Rainbow trout.....	35,795	Smallmouth black bass.....	3,945
Montana:		Rock bass.....	5,500
Largemouth black bass.....	50,628	Crappie.....	2,890
Crappie.....	3,200	Sunfish.....	18,850
Sunfish.....	25,720	Catfish.....	7,325
Catfish.....	3,200	Pike perch.....	403,280,000
Yellow perch.....	18,718	Rainbow trout.....	30,000
Blackspotted trout.....	1,059,120	Oklahoma:	
Brook trout.....	279,335	Largemouth black bass.....	137,135
Rainbow trout.....	1,072,895	Crappie.....	76,080
Lochleven trout.....	3,850,160	Sunfish.....	174,010
Nebraska:		Catfish.....	15,805
Largemouth black bass.....	24,425	Warmouth bass.....	26,400
Rock bass.....	3,500	Rainbow trout.....	900
Crappie.....	30,125	Oregon:	
Sunfish.....	2,100	Blackspotted trout.....	192,800
Catfish.....	4,500	Brook trout.....	132,700
Brook trout.....	217,150	Rainbow trout.....	274,000
Rainbow trout.....	214,510	Chinook salmon.....	24,069,980
Lochleven trout.....	151,500	Silver salmon.....	708,080
Nevada:		Steelhead trout.....	346,789
Brook trout.....	52,000	Pennsylvania:	
Rainbow trout.....	74,000	Largemouth black bass.....	22,225
Lochleven trout.....	40,000	Smallmouth black bass.....	650
New Hampshire:		Rock bass.....	1,450
Smallmouth black bass.....	41,150	Crappie.....	5,765
Catfish.....	2,625	Sunfish.....	37,050
Brook trout.....	900,644	Catfish.....	12,475
Rainbow trout.....	2,000	Yellow perch.....	1,650
Landlocked salmon.....	13,500	Brook trout.....	472,230
New Jersey:		Rainbow trout.....	309,390
Largemouth black bass.....	8,500	Lochleven trout.....	100,710
Smallmouth black bass.....	300	Rhode Island: Smallmouth black	
Crappie.....	750	bass.....	45,000
Sunfish.....	3,100	South Carolina:	
Catfish.....	600	Largemouth black bass.....	313,242
Yellow perch.....	450	Warmouth bass.....	17,482
Brook trout.....	2,400	Crappie.....	1,812
Rainbow trout.....	5,520	Sunfish.....	192,871
New Mexico:		Catfish.....	1,794
Largemouth black bass.....	351,140	Brook trout.....	19,000
Crappie.....	6,900	Rainbow trout.....	196,990
Sunfish.....	79,875	Lochleven trout.....	18,500
Catfish.....	21,055		

Summary, by States, of the distribution of fish, fiscal year 1936—Continued

State and species	Number	State and species	Number
South Dakota:		Virginia—Continued.	
Largemouth black bass.....	22, 716	Shad.....	123, 000
Crappie.....	22, 526	Silver salmon.....	24, 000
Sunfish.....	6, 660	Washington:	
Catfish.....	16, 200	Largemouth black bass.....	23, 620
Yellow perch.....	150	Crappie.....	23, 080
Blackspotted trout.....	30, 816	Sunfish.....	1, 848
Brook trout.....	767, 800	Catfish.....	3, 900
Rainbow trout.....	530, 244	Blackspotted trout.....	1, 433, 400
Lochleven trout.....	169, 200	Brook trout.....	734, 545
Grayling.....	90, 000	Rainbow trout.....	959, 245
Tennessee:		Lochleven trout.....	78, 000
Largemouth black bass.....	74, 765	Steelhead salmon.....	459, 600
Smallmouth black bass.....	20, 000	Grayling.....	250, 000
Rock bass.....	19, 600	Chinook salmon.....	21, 425, 310
Crappie.....	50	Chum salmon.....	14, 168, 067
Sunfish.....	234, 355	Silver salmon.....	3, 663, 970
Brook trout.....	139, 300	Sockeye salmon.....	15, 378, 500
Rainbow trout.....	325, 368	West Virginia:	
Lochleven trout.....	60, 000	Largemouth black bass.....	8, 528
Texas:		Smallmouth black bass.....	62, 267
Largemouth black bass.....	276, 030	Rock bass.....	3, 100
Crappie.....	59, 825	Crappie.....	4, 320
Sunfish.....	157, 830	Sunfish.....	91, 200
Catfish.....	5, 650	Catfish.....	200
Utah:		Blackspotted trout.....	700
Largemouth black bass.....	2, 514	Brook trout.....	433, 300
Blackspotted trout.....	446, 000	Rainbow trout.....	875, 564
Brook trout.....	637, 057	Lochleven trout.....	423, 421
Rainbow trout.....	768, 358	Wisconsin:	
Lochleven trout.....	294, 000	Largemouth black bass.....	285, 600
Silver salmon.....	124, 100	Smallmouth black bass.....	9, 685
Golden trout.....	11, 100	Rock bass.....	1, 225
Grayling.....	22, 700	Crappie.....	3, 688, 190
Vermont:		Sunfish.....	2, 116, 263
Largemouth black bass.....	45, 250	Catfish.....	565, 780
Catfish.....	375	Yellow perch.....	24, 191
Blackspotted trout.....	7, 063	Buffalofish.....	120, 800
Brook trout.....	361, 791	Carp.....	545, 000
Rainbow trout.....	176, 768	Pike and pickerel.....	326, 000
Lochleven trout.....	500	White bass.....	4, 300
Grayling.....	2, 185	Miscellaneous fishes.....	617, 200
Landlocked salmon.....	126, 640	Brook trout.....	596, 800
Virginia:		Rainbow trout.....	305, 300
Largemouth black bass.....	107, 567	Lochleven trout.....	430, 600
Smallmouth black bass.....	10, 196	Wyoming:	
Rock bass.....	15, 420	Largemouth black bass.....	95, 335
Warmouth bass.....	75	Crappie.....	824, 000
Crappie.....	2, 534	Sunfish.....	24, 498
Catfish.....	10	Catfish.....	119, 600
Sunfish.....	78, 759	Blackspotted trout.....	7, 477, 284
Brook trout.....	139, 175	Brook trout.....	1, 118, 256
Yellow perch.....	2, 302	Rainbow trout.....	841, 385
Rainbow trout.....	516, 294	Lochleven trout.....	615, 510
		Grayling.....	4, 810, 500

